

Enhancing our understanding of physical activity and subjective well-being with a lifespan perspective

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Abstract:

Physical activity might be a viable tool for enhancing mental wellbeing because, in general, physical activity has been found to be related to more positive affect and higher satisfaction with life. The way we think, feel, and act changes with age, so it may be that physical activity, wellbeing, and the link between physical activity and wellbeing change with age too. Without consideration for developmental changes, study findings are decontextualized and difficult to translate into people's lives. Aiming to become better equipped to use physical activity as a tool to intervene with wellbeing, we explored a lifespan perspective of physical activity and wellbeing. In this review, we (1) discuss physical activity, wellbeing, and the link between physical activity and wellbeing at different life stages, (2) highlight the need to consider interpersonal and intrapersonal differences in these constructs, and (3) identify gaps in the literature that, if filled, would further enhance our understanding of physical activity and wellbeing across the lifespan.

Keywords: development | life stages | satisfaction with life | affect | exercise | wellbeing

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Enhancing our understanding of physical activity and wellbeing with a lifespan perspective

Amanda L. Hyde · Jaclyn P. Maher · Steriani Elavsky

Abstract: Physical activity might be a viable tool for enhancing mental wellbeing because, in general, physical activity has been found to be related to more positive affect and higher satisfaction with life. The way we think, feel, and act changes with age, so it may be that physical activity, wellbeing, and the link between physical activity and wellbeing change with age too. Without consideration for developmental changes, study findings are decontextualized and difficult to translate into people's lives. Aiming to become better equipped to use physical activity as a tool to intervene with wellbeing, we explored a lifespan perspective of physical activity and wellbeing. In this review, we (1) discuss physical activity, wellbeing, and the link between physical activity and wellbeing at different life stages, (2) highlight the need to consider interpersonal and intrapersonal differences in these constructs, and (3) identify gaps in the literature that, if filled, would further enhance our understanding of physical activity and wellbeing across the lifespan.

Keywords: development, life stages, satisfaction with life, affect, exercise, wellbeing

1. Introduction

Physical activity significantly enhances mental wellbeing at any age (Physical Activity Guidelines Advisory Committee, 2008), but affect, behavior, and cognition is subject to change across the lifespan, and these developmental changes may result in differences in physical activity, wellbeing, and in the link between physical activity and wellbeing across life stages. Most research on physical activity and wellbeing has been conducted on samples with restricted age ranges, such as middle-aged women (e.g., Elavsky & McAuley, 2005) or older adults (e.g., Arent, Landers, & Etnier, 2000; McAuley et al., 2006). This narrative review aims to put forth a lifespan perspective by presenting previous research findings about physical activity and wellbeing at different life stages and highlighting future avenues of research that are necessary to fill gaps in the literature.

Based on the work of Diener (1984) and Diener, Suh, Lucas, and Smith (1999), we define wellbeing as the preponderance of positivity of affect and high satisfaction with life. In general, people highly value their wellbeing and strive to be happy and satisfied with life (Diener, 2000). Physical activity may be a viable tool for enhancing wellbeing because, in general, physical activity has been found to be related to more positive affect and higher satisfaction with life (Arent et al., 2000; Ekkekakis, Parfitt, & Petruzzello, 2011; Ekkekakis, 2003; Netz, Wu, Becker, & Tenenbaum, 2005; Penedo & Dahn, 2005; Rejeski & Mihalko, 2001); however, the magnitude of the effects vary widely across studies and individuals. For example, Netz and colleagues (2005) found that age moderated the effect of physical activity on wellbeing in older

adults, with larger effects seen for people around age 65 years compared to people around age 74 years. Without considering context, such as life stage, this variable evidence cannot be easily translated into people's lives. It is our contention that a better understanding of physical activity and wellbeing will be reached through applying a lifespan perspective.

A lifespan perspective can help contextualize physical activity and wellbeing into the always-evolving physical, psychological, biological, and environmental factors that manifest in life (Baltes, 1987). The key suppositions of a lifespan perspective include the following: (1) development is a lifelong process, with changes occurring throughout the entire lifespan; (2) change is multifaceted, manifesting growths and declines of biological, personal, and environmental factors; (3) development is highly variable between people (i.e., individual differences) and across time (i.e., intrapersonal changes); and (4) development is embedded in multiple aspects of life, represented by age-related differences, social customs, and historical influences. A lifespan perspective details general trends across life and how characteristics of an individual and differences in life experiences can lead to deviations from general trends (Baltes, Reese, & Lipsitt, 1980; Baltes, 1987). The initial step toward taking a lifespan perspective of physical activity and wellbeing is to determine the general trends of physical activity, wellbeing, and the relation between these two constructs across the stages of life. Figures 1 and 2 (below) are examples of lifespan perspective of physical activity and wellbeing, respectively. Depicted in these schemas are general trends as well as examples of individual differences, life events, and daily changes that can impact these trajectories. Following, we discuss previous research on general trends in physical activity and wellbeing and links between physical activity and wellbeing across life stages.

2. General trends in physical activity and wellbeing across life stages

2.1 Childhood (3–9 years)

2.1.1 Physical activity

There is limited research tracking physical activity from childhood across the entire lifespan, but studies of prevalence rates of physical activity in children and trends from childhood to adolescence suggest childhood is characterized by higher levels of physical activity than other times in the lifespan. Based on a cross-sectional study using accelerometers, it was found that children were over five times more likely to participate in 60 minutes of physical activity per day than adolescents or adults (Troiano et al., 2008). Pate and colleagues (2002) found that over 90% of school-aged children (7–16 years old) were engaging in at least 30 minutes of moderate physical activity per day on five or more days a week. Overall, the evidence shows that children are more likely to be meeting or exceeding physical activity guidelines than populations of other ages; however, most children are still not as physically active as they should be. The American Physical Activity Guidelines recommend children participate in 60 minutes of physical activity daily (Physical Activity Guidelines Advisory Committee, 2008).

Childhood may have higher rates of physical activity than other life stages because there are fewer barriers to physical activity during this time in the lifespan. Some of the most commonly reported barriers to physical activity do not become a problem until well after childhood. For example, people commonly report that they are not physically active because of a lack of available time, feeling too tired, or having no motivation (Brownson, Baker, Housemann, Brennan, & Bacak, 2001). Childhood, however, is characterized by free time, energy, and an intrinsic value for play (Hughes, 1995). Beyond a lack of barriers, greater intrinsic motivation might explain high levels of physical activity in children. It is not beliefs in

the health, social, or physical benefits of physical activity that are associated with more physical activity in childhood (Strauss, Rodzisky, Burack, & Colin, 2001); rather, children are physically active when they enjoy the activity and get a sense of accomplishment out of it (Weiss, 2000). As a time of few barriers and greater intrinsic motivation to be physically active, childhood is more amenable to high levels of physical activity participation than are other developmental stages.

2.1.2 Wellbeing

It remains ambiguous how wellbeing in childhood compares to other stages in life because studies on lifespan trajectories of wellbeing tend to start in early adulthood. Future research is needed that compares wellbeing in childhood to wellbeing in other life stages. Although direct comparisons have not been made with other life stages, studies suggest children are mostly happy (Holder, Coleman, & Wallace, 2010; Holder & Klassen, 2010; Larson & Lampman-Petratis, 1989) and satisfied with their lives (Proctor, Linley, & Maltby, 2009). Some evidence suggests wellbeing may start to decrease around 10 years old with the transition into adolescence (e.g., Greene, 1990; Larson & Lampman-Petratis, 1989).

The tendency for children to have high wellbeing may be due to the amount of leisure time available during this stage of the lifespan and how children fill this time. Childhood is characterized by ample free time to play (Hughes, 1995). This opportunity for spending a large amount of time in freely selected, enjoyable, unencumbered activities can lead to positive affect and, because leisure is a major component of overall satisfaction (Argyle, 2001; Caldwell, 2005), play might also enhance satisfaction with life. Another reason children might generally have high wellbeing is the availability of opportunities to acquire senses of autonomy, relatedness, and competence—basic needs that are strongly connected to wellbeing (Ryan & Deci, 2000). Such opportunities are present when children receive encouragement from important others to learn independence and develop new skills. These same opportunities to build motor, language, and cognitive skills are typically not as richly available after the transition from childhood.

2.1.3 Physical activity and wellbeing

There is well-documented evidence that physical activity is associated with aspects of good mental health in children, including high self-esteem, low symptoms of anxiety and depression, and low stress (Crews, Lochbaum, & Landers, 2004; Gruber, 1986; Mutrie & Parfitt, 1998; Parfitt & Eston, 2005; Strong et al., 2005), but there is little research on the effects of physical activity on satisfaction with life or affect in children. It has been shown that physical activity can acutely enhance mood in children (Williamson, Dewey, & Steinberg, 2001), and although life satisfaction can meaningfully be measured in children as young as age six (Huebner, 2004), little is known about the effects of physical activity on satisfaction with life or the long-term affective consequences of physical activity in children. Future research is needed to determine the links between physical activity and wellbeing in childhood.

2.2 Adolescence (10–17 years)

2.2.1 Physical activity

There is generally a steep decrease in physical activity seen across the teenage years (Caspersen, Pereira, & Curran, 2000; Kjønniksen, Torsheim, & Wold, 2008; Riddoch et al., 2004; Sallis, Prochaska, & Taylor, 2000; Telama & Yang, 2000; Trost, Pate, et al., 2002). This has been

shown in longitudinal studies of both self-reported (Kjønniksen et al., 2008; Telama & Yang, 2000) and directly-assessed physical activity (Riddoch et al., 2004; Trost, Owen, Bauman, Sallis, & Brown, 2002). As a result of the decline in physical activity across adolescence, the percentage of people participating in regular moderate and vigorous physical activity significantly drops within the age range of 15 to 18 years old (Pate et al., 2002; Troiano et al., 2008). Adolescence is a time of transitions, and unfortunately it seems these transitions include a decline in physical activity. Objective physical activity surveillance indicates that only 8% of adolescents are participating in an average of at least 60 minutes of physical activity per day (Troiano et al., 2008).

It may be that declines in physical activity across adolescence are due to shifts in time constraints, received support for playful behavior, or preferences and motivations for physical activities during this life stage. Expectations for less playful behavior and more work- or school-related demands can result in less allocated time for physical activity (Larson & Verma, 1999). Additionally, declines in physical activity competencies and preferences for physical activities have been shown to explain declines in physical activity behavior in the early adolescent years (Sallis, Alcaraz, McKenzie, & Hovell, 1999). Priorities, responsibilities, and attitudes shift dramatically in adolescence and it seems that physical activity levels suffer because of it.

2.2.2 Wellbeing

Adolescence is typically characterized by lower levels of wellbeing than in childhood. In fact, satisfaction with life declines from age 11 to 16 (Goldbeck, Schmitz, Besier, Herschbach, & Henrich, 2007) and, although most adolescents report they are satisfied with their life overall, a noteworthy 11% of adolescents report being highly dissatisfied (Huebner, Drane, & Valois, 2000). In general, affect also becomes less positive across the transition from childhood to adolescence and continues to decline until late adolescence (Greene, 1990; Larson, Moneta, Richards, & Wilson, 2002; Moneta, Schneider, & Csikszentmihalyi, 2001).

Neurobiological, cognitive, and environmental shifts may each be responsible for the decline in wellbeing that is typical of adolescence. The brain systems responsible for emotional regulation, risk-taking behaviors, and elevations of depression and anxiety undergo structural and functional evolution during adolescence which may result in decreased wellbeing (Casey, Jones, & Hare, 2008; Ernst, Pine, & Hardin, 2006; Yurgelun-Todd, 2007). Such neurobiological changes may also co-occur with changes of perceptions and motivation that enhance the decline of wellbeing. For example, in adolescence, mental health can become highly contingent on popularity and peer acceptance (Bukowski, Hoza, & Boivin, 1993); therefore environmental factors such as peer victimization can have devastating consequences for an adolescent's satisfaction with life and affect (Martin & Huebner, 2007). It has also been postulated that the reduction in positivity of affect seen in adolescence may be a result of an increase in exposure to stressful events (Larson & Ham, 1993). All the developmental changes occurring in adolescence can make coping with stressors a tumultuous task and, as a result, an individual's wellbeing can suffer.

2.2.3 Physical activity and wellbeing

In adolescence, both physical activity and wellbeing tend to be declining. This makes it essential that we understand the link between physical activity and wellbeing during this stage of life. A study has shown that adolescents who are not physically active have lower levels of satisfaction of life than their more physically active peers (Valois, Zullig, Huebner, & Drane,

2004). Little is understood about the long-term affective consequences of physical activity, but some studies have shown acute positive affective responses to physical activity in adolescents (Schneider, Dunn, & Cooper, 2009; Schneider & Graham, 2009). Future research is necessary to further establish the link between physical activity and positive affect in adolescence. Although relevant studies are limited in number, the existing evidence base suggests that physical activity is linked to wellbeing in adolescence.

2.3 Emerging adulthood (18–25 years)

2.3.1 Physical activity

Cross-sectional and longitudinal research shows that physical activity levels during emerging adulthood continue to follow the decreasing trend that emerged in adolescence (Caspersen et al., 2000; Kjønniksen et al., 2008; Troiano et al., 2008). The decline is steepest around age 18 years, with the exception that certain physical activities such as jogging alone, cycling, and some organized sports tend to strongly track across this stage of life (Kjønniksen et al., 2008). Approximately one-third of emerging adults engage in no leisure-time physical activity (Barnes, 2007; Pleis, Lucas, & Ward, 2009).

Given that emerging adulthood is characterized by shifting values and goals, it would not be surprising if physical activity motivation was also shown to shift during emerging adulthood. It may be that whereas physical activity is regulated by intrinsic motivation at younger ages (Weiss, 2000), physical activity may be more regulated by extrinsic motivation (e.g., improving appearance, weight loss) in emerging adults. Additionally, emerging adults may be faced with more barriers to physical activity than were present at an earlier age. The commonly listed barriers of a lack of time, energy, or motivation may be especially relevant during emerging adulthood when individuals are taking on many other responsibilities and priorities (Brownson et al., 2001). In addition to shifts in motivation, physical activity may decline during emerging adulthood due to disrupted habits, as research has shown that habits regulate physical activity (Gardner, De Bruijn, & Lally, 2011; Verplanken & Melkevik, 2008). Habits are automatic behavioral responses to contextual cues (e.g., exercising every day after high school), so when transitions occur in which contextual cues are displaced (e.g., graduating high school), habits may be displaced and physical activity levels suffer.

2.3.2 Wellbeing

Emerging adulthood is characterized by a sharp decline in wellbeing (Carstensen et al., 2011; Stone, Schwartz, Broderick, & Deaton, 2010). Both cross-sectional and longitudinal studies have shown that people have fewer positive emotional experiences during emerging adulthood than during adulthood (Carstensen et al., 2011). Satisfaction with life steeply declines in emerging adulthood from rates that are not recovered again until older age (Stone et al., 2010). At a time of life that should be full of excitement and vitality, emerging adulthood is characterized by typically low positive affect and declines in satisfaction with life.

Low levels of positive affect may be the result of an inability to regulate the multitude of emotional experiences that can occur at this age (Carstensen et al., 2011). Also, emerging adults are still developing effective emotional regulation skills and can be faced with an onslaught of hardships related to accepting responsibility, making major life decisions, and becoming financially independent (Arnett, 2000). Additionally, the socioemotional selectivity theory proposes that people experience less positive emotions at this early stage of adulthood because time is perceived as open-ended, so knowledge-attaining goals are prioritized over emotional

goals (Carstensen, Isaacowitz, & Charles, 1999). Satisfaction with life may also decrease during emerging adulthood because of the risks associated with exploration. Failed career, scholarly, or romantic efforts may lead to discouragement and dissatisfaction with life. Emerging adulthood is a time of development and growth; unfortunately, it seems that these challenges may have detrimental consequences for wellbeing.

2.3.3 Physical activity and wellbeing

One study found that when emerging adults participated in more physical activity than typical, their satisfaction with life was also higher than usual (Maher et al., 2012). Another study found that emerging adults who were more physically active tended to experience more pleasant-activated feelings (e.g., excitement, happiness) than emerging adults who were less active; and that when emerging adults were more physically active than was typical for them, they experienced more pleasant-activated feelings (Hyde, Conroy, Pincus, & Ram, 2011). Studies have also linked physical activity to increases in positive affect in emerging adults (McIntyre & Watson, 1990; Watson, 1988). Primarily, research on physical activity and wellbeing in emerging adulthood has focused on college students; therefore the results cannot be generalized to the “forgotten half” of emerging adults who do not attend college (Halperin, 2001).

2.4 Adulthood (26–65 years)

2.4.1 Physical activity

The decline in physical activity seen in adolescence and emerging adulthood levels off in adulthood and physical activity levels remain relatively stable at a low level until gradually declining again nearing the transition to older age (Caspersen et al., 2000; Troiano et al., 2008; Tucker, Welk, & Beyler, 2011). At the start of adulthood, 32% of adults report engaging in no leisure time physical activity, and this number increases to around 40% at the conclusion of adulthood (Barnes, 2007; Tucker et al., 2011). Directly-measured physical activity data show that fewer than 5% of adults are participating in an average of 30 minutes of physical activity per day (Troiano et al., 2008).

Physical activity may be deprioritized during adulthood. Initiatives for being physically active are oftentimes self-oriented (e.g., I want to be healthier, lose weight, or have fun); such goals are typically displaced by more family-oriented goals (e.g., I want to raise healthy children, financially support my family, or be a good spouse) during adulthood (Nurmi, 1992). When physical activity is perceived as less important than other responsibilities, it is compromised as a result of lack of time and resources. Indeed, lack of time and energy are the primary barriers to physical activity reported by adults (Brownson et al., 2001). The typically low levels of physical activity characteristic of adulthood may be stable during adulthood because daily life tends to be more regularly structured than during other life stages so habits are likely to be developed and sustained (Verplanken & Wood, 2006; Wood & Neal, 2007). Priorities and habits in adulthood are typically not correspondent with high levels of physical activity, which may explain why stable low physical activity levels are present in this life stage.

2.4.2 Wellbeing

Adults tend to have a stronger preponderance of positive affect than do emerging adults and this positive trend continues throughout adulthood (Carstensen et al., 2011; Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Charles, Reynolds, & Gatz, 2001; Diener & Diener, 1996).

The preponderance of positive affect is a result of there being less negative affect, rather than just an increase of positive affect. There are mixed results concerning the exact trajectory of satisfaction with life across adulthood. An assortment of studies has shown that satisfaction with life decreases, increases, or is stable across adulthood (Diener & Suh, 1997; Herzog & Rodgers, 1981; Horley & Lavery, 1995; Lang & Heckhausen, 2001; Mroczek & Spiro, 2005; Prenda & Lachman, 2001; Stone et al., 2010). As evidenced from the disparate findings of these studies, the trajectory of satisfaction with life is unclear. It may be that satisfaction with life varies more between-persons in adulthood than in other life stages. Fortunately, the majority of adults are happy and satisfied with life (Diener & Diener, 1996; Diener et al., 1999).

The positive shift in trajectory of wellbeing that occurs in adulthood is proposed to be a result of motivational and emotion regulation developmental changes. The socioemotional selectivity theory suggests that as they age, adults begin to perceive time as limited and shift motivational focus from knowledge acquisition goals to emotional goals (Carstensen et al., 2011, 1999). As a result, adults start avoiding situations that likely result in negative emotional experiences and rather focus on the people and scenarios that tend to lead to more positive emotional experiences. Additionally, there is evidence to suggest that adults use more effective emotional regulation strategies than emerging adults (John & Gross, 2004). Adults may regulate emotions more by changing the way they think about situations and less by changing the way they act than emerging adults. Emotion regulation develops in adaptive ways in adulthood, which leads to better wellbeing; however, there is growing research in recent years showing that stress reactivity and mood instability increase with age (Sliwinski, Almeida, Smyth, & Stawski, 2009). This research suggests that the observed increase in positivity of affect present in adulthood is due to adjusting goals or expectations and avoiding stressful situations rather than the result of better emotional regulation.

2.4.3 Physical activity and wellbeing

Physical activity has been shown to predict positive affect in survey (Stephens, 1988), intervention (Reed & Buck, 2009; Reed & Ones, 2006), and experience sampling (Gauvin, Rejeski, & Norris, 1996; Hyde, Conroy, Pincus, & Ram, 2011) studies. Most adult studies on physical activity and satisfaction with life have focused on subpopulations such as cancer patients and survivors and middle-aged women (e.g., Courneya & Friedenreich, 1999; Elavsky & McAuley, 2005). For example, Elavsky and McAuley (2005) studied perimenopausal and post-menopausal women and found that the relation between physical activity and life satisfaction was mediated by physical self-worth and menopausal symptoms. Future research on broader populations of adults is necessary to generalize these results to a wider range of adults.

2.5 Old age (65 years and older)

2.5.1 Physical activity

Although some data indicate possible increases in self-reported physical activity in those 65 years and older (Caspersen et al., 2000), negative trends in physical activity participation are corroborated by objective surveillance data (Davis & Fox, 2006; Troiano et al., 2008). One such study estimated that older adults (M age = 76 years) average about two-thirds of the estimated physical activity energy expenditure and perform half as many minutes of moderate physical activity as younger adults (M age = 27 years; Davis & Fox, 2006). These trends continue across old age with an increasing proportion of older adults engaging in no leisure time physical

activity (e.g., 65–74 years or “young old” at 46% versus 75+ or “middle/old old” years at 56%), less moderate and vigorous physical activity (26% & 18% versus 15% & 8% for moderate and vigorous physical activity for “young old” and “middle/old old”, respectively), and fewer older adults meeting current physical activity guidelines with advancing age (Pleis et al., 2009; Tucker et al., 2011). Overall, nearly 52% of older adults report engaging in no leisure-time physical activity (Barnes, 2007).

There are motivational changes in terms of what drives older adults to adopt or maintain physical activity. Older adults are less likely to be motivated by appearance or body image than young adults (Brunet & Sabiston, 2011) and instead choose to stay active to maintain their physical and mental health, functional independence, and for social benefits (Belza et al., 2004; Cohen-Mansfield, Marx, Biddison, & Guralnik, 2004). Additionally, health problems and functional limitations present barriers to physical activity participation for many older adults that were not present in younger age (Belza et al., 2004; Brawley, Rejeski, & King, 2003; Cohen-Mansfield et al., 2004; Schutzer & Graves, 2004). Older adults report walking as their activity of choice (Belza et al., 2004) and self-report averaging approximately 3.6 hours of walking per week (Salmon, Owen, Crawford, Bauman, & Sallis, 2003). It may be that preferred less intense physical activity, such as walking, replaces more vigorous physical activities that were performed during younger age, so that less energy is expended in old age. Changes in motivation, abilities (actual and perceived), and preferences may help explain the decline of physical activity present in old age.

2.5.2 Wellbeing

Although both young and old adults have expectations that they will become less happy as they age, cross-sectional comparisons show a tendency for older people to report more happiness (Lacey, Smith, & Ubel, 2006) and more positivity of affect (Carstensen et al., 2011, 2000; Gross et al., 1997) than their younger counterparts. The increase in positivity drops off at age 60, suggesting there may be a point in the lifespan where affect stops becoming more positive, and instead stabilizes or even declines (Carstensen et al., 2011; Charles et al., 2001). The decrease in positivity of affect in older years, however, does not compare in magnitude to the increase in positivity that occurred in adulthood. Although there is some evidence that life satisfaction increases in a linear fashion with age (Prenda & Lachman, 2001), other studies show that satisfaction with life peaks in midlife (Lang & Heckhausen, 2001) or between age 65 and 70, gradually decreasing thereafter (Mroczek & Spiro, 2005).

Shifts in motivation and emotion regulation may help explain the enhancement of wellbeing seen in old age. Older adults show more flexibility in adjusting goals than younger adults and regulate goals with the primary purpose of avoiding losses as opposed to striving for gains (Heckhausen, Wrosch, & Schulz, 2010; Heckhausen, 1997). Namely, older adults are more likely to disengage from unobtainable or unrealistic goals and are more likely to adopt more age-appropriate goals. Compared to younger adults, older adults are also more likely to view themselves as healthier or more exceptional when compared to others (Heckhausen, 1997). These adaptive tendencies help older adults optimize their development by protecting their self-esteem and motivational resources from the negative impact of failure or loss experiences (Heckhausen et al., 2010). The constraints on time horizons in old age (i.e., perceived limits on future time) may also continue to shift motivation towards regulation of emotional states (e.g., appreciating life or being happy) over other types of goals (Carstensen et al., 1999). These motivational shifts are likely to have implications for wellbeing in old age.

2.5.3 Physical activity and wellbeing

Cross-sectional and longitudinal data indicate that physical activity indirectly enhances satisfaction with life in old age through its influence on affect, mental health, and self-efficacy (Elavsky et al., 2005; McAuley et al., 2006). For example, McAuley and colleagues (2006) showed that greater amounts of physical activity were associated with greater self-efficacy, which was associated with more positive physical and mental health. In turn, health status was positively related to satisfaction with life. Elavsky and colleagues (2005) found that self-efficacy and positive affect were significant mediators of the association between physical activity and wellbeing (i.e. global quality of life) at a 1-year follow-up of a physical activity intervention for older adults, and that changes in positive affect mediated this relation across an additional four years of follow-up.

2.6 Summary

Based on the current literature, it seems that the highest levels of physical activity seem to occur in childhood, followed by a steep drop-off in adolescence, continued decline in emerging adulthood, stabilization in adulthood, and another drop-off in old age (see Figure 1). In contrast, wellbeing seems to start high in childhood, drop-off throughout adolescence, emerging adulthood, and adulthood, increase in old age, and gradually decline in the oldest age (see Figure 2 below). Although physical activity has been shown to be linked to wellbeing at different ages, little is understood about how the link between physical activity and wellbeing changes across life stages.

Figure 1. A representative schematic of how physical activity changes across the lifespan including how individual differences (sex), life events (first child), and daily changes may impact the trajectory

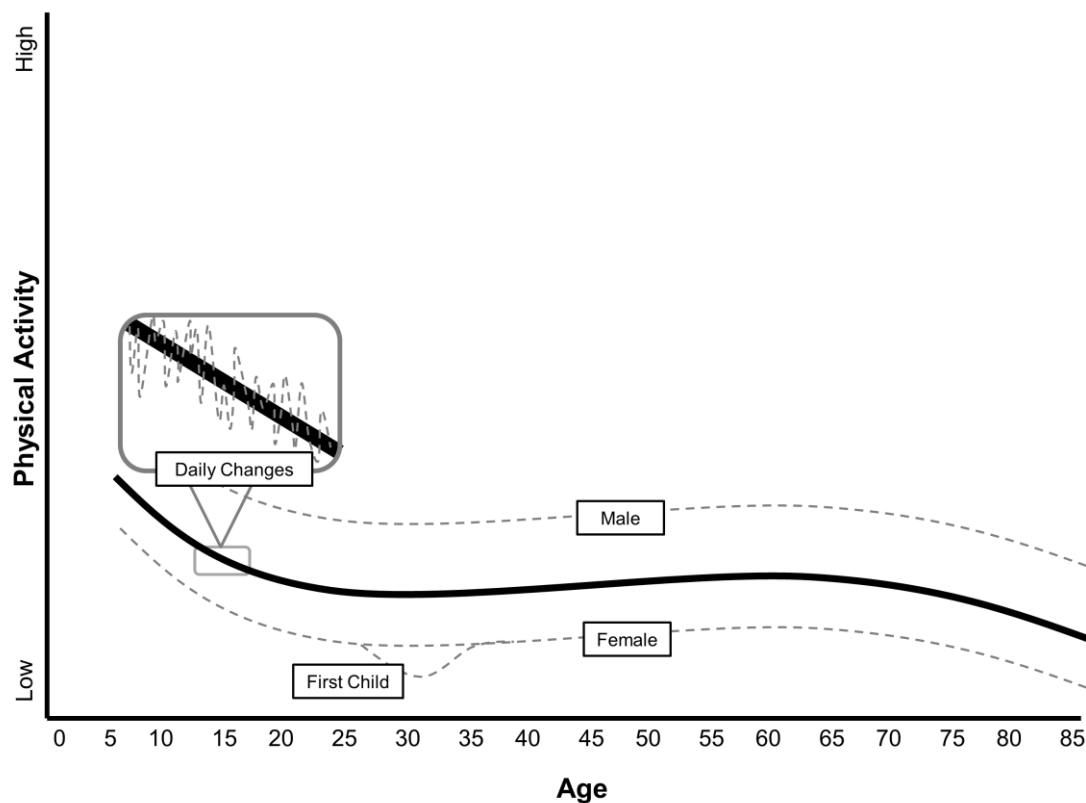
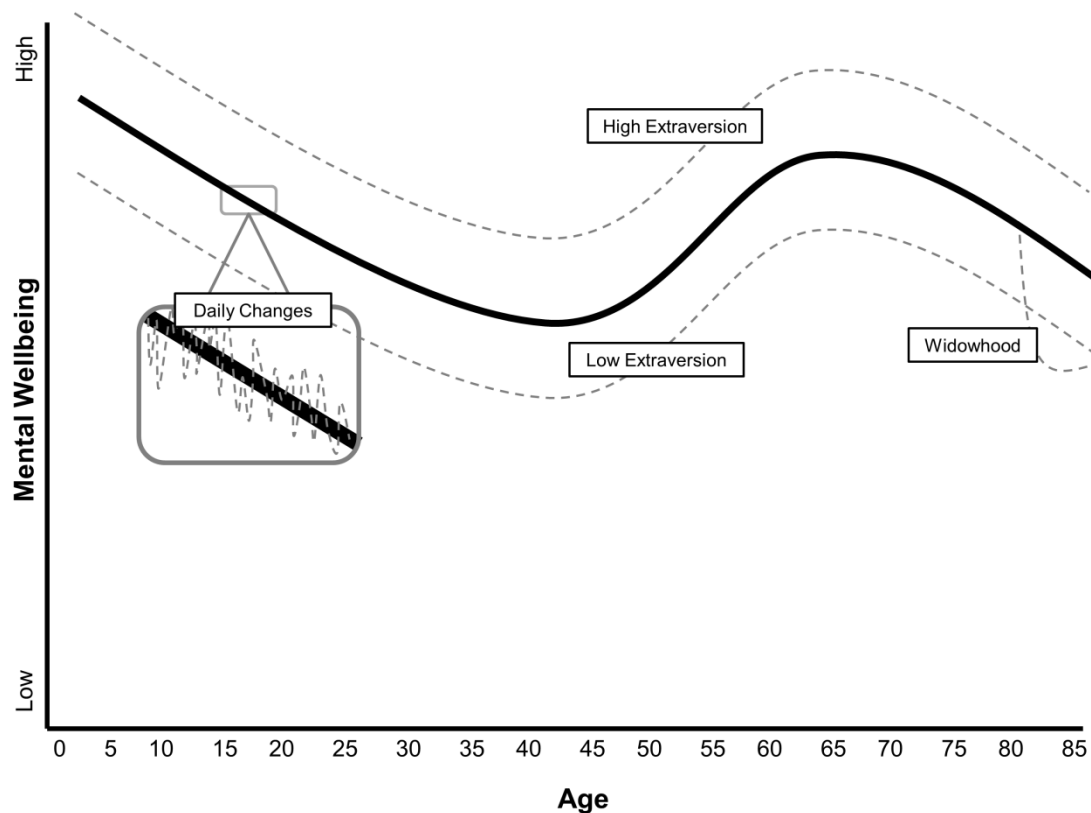


Figure 2. A representative schematic of how wellbeing changes across the lifespan including how individual differences (extraversion), life events (widowhood), and daily changes may impact the trajectory



3. Interpersonal and intrapersonal differences

It is important to note that the trajectory of physical activity and wellbeing across the lifespan is oversimplified when considered as general trends (Baltes et al., 1980; Baltes, 1987; Nesselroade & Ram, 2004; Ram & Gerstorf, 2009). Taking a lifespan perspective also includes considering how physical activity and wellbeing vary at interpersonal and intrapersonal levels, and how these differences can vary across life stages. Following, we will discuss how individual differences, life events, and daily changes may impact trajectories of physical activity and wellbeing. Examples of each are also depicted in Figures 1 and 2 (see Appendices).

3.1 Physical activity

Strong evidence suggests that physical activity varies systematically as a function of certain individual differences. For example, people who are more extraverted and less neurotic tend to participate in more physical activity than their counterparts (Rhodes & Smith, 2006). Additionally, males are typically more physically active than females across the lifespan (Caspersen et al., 2000; Sallis et al., 2000; Trost, Pate, et al., 2002). Physical activity also varies on an intrapersonal level. Studies with repeated assessments of physical activity tend to show that half of the variability in physical activity is attributable to intrapersonal change (Conroy, Elavsky, Hyde, & Doerksen, 2011; Hyde et al., 2011; Matthews, Ainsworth, Thompson, & Bassett, 2002).

Beyond intrapersonal changes in physical activity across life stages, physical activity also changes in accordance with major life events. For example, getting married or having a first child tends to decrease physical activity participation levels (Brown & Trost, 2003).

Intrapersonal variability of physical activity is also present on shorter time scales. For example, intrapersonal fluctuations in physical activity has been shown to systematically vary between weekdays and weekends (e.g., Conroy et al., 2011; Matthews et al., 2002; Trost, Pate, Freedson, Sallis, & Taylor, 2000). Differences between people, major life-changing events, and minor differences between days can impact physical activity participation.

3.2 Wellbeing

Not surprisingly, some people are happier and more satisfied with their lives than others. Some variability in wellbeing is heritable through a temperamental predisposition for positivity and satisfaction with life (Diener et al., 1999). Other interpersonal variability is attributable to traits. Several studies show that people who are more extraverted and less neurotic tend to have higher wellbeing than their counterparts (Costa & McCrae, 1980; Diener et al., 1999; Hayes & Joseph, 2003; Huebner, 1991; Larsen & Ketelaar, 1991). Additionally, life events such as getting married, having children, or widowhood have been shown to greatly impact wellbeing (Clark & Oswald, 2002). Most studies have focused on explaining interpersonal differences in wellbeing, but positivity and satisfaction with life have been shown to vary at an intrapersonal level (Fujita & Diener, 2005; Heller, Watson, & Ilies, 2006; Hyde et al., 2011; Maher et al., 2012; Röcke, Li, & Smith, 2009; Suh, Diener, & Fujita, 1996; Watson, 1988). Most repeated assessment studies found that intrapersonal fluctuations account for more than half of the variability in positivity and satisfaction with life.

We have addressed intrapersonal changes in wellbeing across life stages, but wellbeing also systematically varies as a function of certain major life events. For example, marriage and widowhood lead to increases and decreases in wellbeing, respectively (Diener, 2000; Gove & Shin, 1989; Winter, Lawton, Casten, & Sando, 1999). Changes in wellbeing can also be the result of more minor events. Greater social activity, higher physical health, and less perceived stress are related to high fluctuations in wellbeing (Bolger, DeLongis, Kessler, & Schilling, 1989; Mroczek & Spiro, 2005; Watson, 1988). Importantly, the amount by which wellbeing fluctuates at an intrapersonal level can depend on life stage. For example, older adults tend to have less variability in positive and negative affect than young adults (Röcke et al., 2009). Similar to physical activity, wellbeing differs between people, and across the lifespan, major life stages, and days.

4. Gaps in the literature

This brief review has highlighted several gaps within the literature that need to be addressed. These gaps include (1) descriptions of wellbeing in childhood, (2) tests of links between physical activity and wellbeing in childhood, (3) tests of links between physical activity and preponderance of positive affect in adolescence, (4) tests of links between physical activity and satisfaction with life in general adults (i.e., not subpopulations), (5) longitudinal and experimental studies tracking the magnitude and underlying mechanisms of the relation between physical activity and wellbeing across the entire lifespan, and (6) tests of the impact of individual differences and life events on the link between physical activity and wellbeing at different life stages.

5. Conclusions

People's affect, behaviors, and cognitions change across life stages and it is likely that these changes (ultimately reflected in changing motivations, behavioral choices, and affective

regulation) will have notable impact on the processes connecting physical activity and wellbeing. Little is known about how the link between physical activity and wellbeing changes across the lifespan, and even less is understood about causality and underlying mechanisms of this relation. We look forward to research that takes on a lifespan perspective to fill these gaps in physical activity and wellbeing literature. Additionally, this review should serve as an example of how other wellbeing research could benefit from implementing a lifespan perspective.

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